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ENERGY $AVER$

"... For Business and Industry".

VOLUME 1 / NUMBER 2

CONTROL YOUR VEHICLE PLUG-INS AND SAVE

The Facts ...

Alberta motorists can get all the benefits of their engine block heater — and at a reasonable cost — by choosing the right type of control device for their block heater plug-ins.

Block heaters help vehicles to start more readily in cold weather. They also reduce maintenance and operating costs and engine wear by providing fast lubrication at start-up and better fuel economy. Windows defrost faster and vehicle interiors heat quicker, affording a safer and more comfortable ride.

Engine tests show that a vehicle block heater need not be plugged in continuously for easy cold-weather starting. This means that block heaters can be turned on and off with a plug-in control device for big energy dollar savings.

Plug-in control devices operate in different ways. Some controllers have a timing mechanism which regulates how long plug-ins will be on. Others have a temperature sensing device (thermostat) that turns plug-ins on and off at pre-set temperatures. The greatest cost savings can be achieved when plug-ins are controlled by both time and temperature. Combining the two types of controllers (timer and thermostat) or installing a unit with both features should result in the best savings potential.

Many people use their block heaters as a starting aid only on severely cold days. Others incur an unnecessarily high cost by plugging in for the full time their vehicle is parked in winter. Using a simple controller, such as a thermostatic plug-in cord, can save these motorists money.

Test reports indicate that the minimum temperature for reliable engine starting is −7°C (threshold temperature). Even on the coldest days, most engines can be heated to the threshold temperature in about one and a half hours. In employee parking lots where vehicles are normally plugged in for the full working day, a controller which turns plug-ins on an hour and a half before quitting time, can reduce the time electricity is consumed by up to 80 per cent.

Based on Alberta weather data for 1986, plug-ins controlled by a thermostat set at −7°C would have been on 55 per cent of the time during that winter — a saving of 45 per cent of the electrical energy.

Using a timer to cycle plug-ins on and off can also reduce the electrical energy needed to maintain engines at or near −7°C. Depending on the engine size and its heat retaining capacity, the plug-ins can be turned on and off every 15 to 30 minutes. Engine tests show that even at extremely cold temperatures, plug-ins need be on only 50 per cent of the time to maintain engine temperatures close to the threshold or higher.

Controlling plug-ins with both a thermostat and a cycling timer can reduce electrical energy use, under optimum conditions, by 83 per cent

The Misericordia Hospital in Edmonton has plug-in facilities for over 700 vehicles in its parking areas.

(cycling reduces the thermostatically controlled on time by half). The actual dollar savings for each user will vary somewhere between the optimum and 50 per cent because of the impact different utility rate structures have on electrical energy costs.

Electrical costs are a combination of energy and demand charges. The demand portion of the electrical bill depends on the how many plug-ins and other electrical devices are operating during the time a new peak demand is being set. Cycling alternate sections of parking lot plug-ins can reduce the plug-in electrical demand by about 50 per cent.

Plug-in controllers have two functional components — a controlling device based on time, temperature, or both, and a switching mechanism which interrupts the power supply to the plug-ins. Large power switches usually cost more but can control more plug-ins. Smaller switches are less expensive, but more are needed to control the same number of vehicles. The result is that the cost of switches per plug-in remains essentially the same at about $30 to $50.

Only one set of control components is required for each multiple-vehicle system. The larger the number of plug-ins in the lot, the smaller the cost of the control device per vehicle.

The control component can be selected to control energy, demand, or both. Whichever contributes most to the cost of electricity should be given priority. Up to 80 per cent of the energy and 50 per cent of the demand cost can readily be saved.

Reducing electrical cost is a major concern of most businesses and industries. Plug-in controllers can provide a cost-effective way to use electricity more efficiently, and thus reduce these costs. Normally, a payback period of less than two years can be expected.

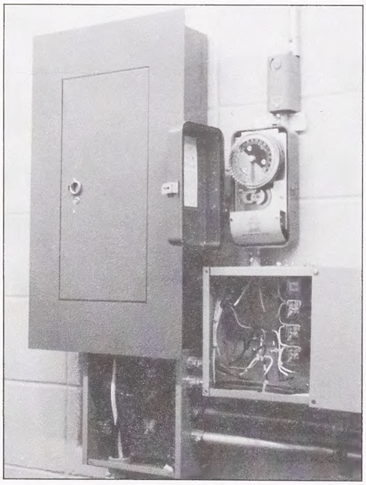
Electricity is one of the more expensive forms of energy in Alberta. It makes good dollar sense to use it wisely.

The Application . . .

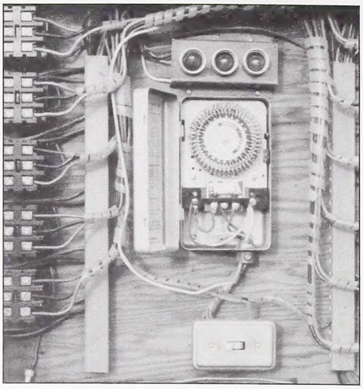
In August 1984, Alberta's Energy Bus, a mobile energy audit service, visited the Edmonton Misericordia Hospital to assess its energy use and the potential for energy cost savings. During the audit, the Energy Bus team noted that the hospital had four large parking lots with a combined capacity of 700 vehicles. The four lots were equipped with plug-in controllers but because of equipment and operating difficulties, the controllers were not in service. As a result, electrical power was being supplied to the plug-ins continuously.

Two types of control systems existed. One type was to cycle alternate halves of the lot on and off, and when functioning, could have resulted in a 50 per cent saving of both electrical demand and consumption (energy) costs. The other system could cycle alternate halves of the lot as well as thermostatically control the plug-ins. If operational, this system would result in a 50 per cent electrical demand cost saving and about an 80 per cent consumption (energy) cost saving.

The hospital is a large user of electricity. Based on its actual usage and the electrical billing rate involved, the Energy Bus audit determined that the major potential for savings associated with vehicle plug-ins would result from controlling demand.



This parking lot control system has a thermostat set at -7°C and a timer that operates on a 15-minute cycle.



This is a multi-circuit contactor panel. Each set of contactors controls power distribution to 12 vehicles

The audit team identified potential electrical savings of $15 000 (or $21 per vehicle) per year by resuming operation of the existing plug-in control systems. Following the audit, the hospital activated some of these systems. However, because of equipment problems, control of all the plug-ins could not be implemented.

To address the problem areas — in order to obtain optimum savings while providing acceptable service — the hospital undertook a feasibility study of equipment repair and modification and investigated new control system options for their plug-ins. The study resulted in the installation of a new control system and modifications to some of the original equipment.

The Bottom Line . . .

For owners and managers of industrial and commercial facilities in Alberta, the annual cost of operating vehicle plug-ins and the potential for saving energy dollars can vary considerably. The variation in costs and savings depends on the local electrical utility rate structure and the amount of electricity used by each consumer.

Table 1 shows a range of annual electrical costs for operating parking lot plug-ins in Alberta. The costs are based on different rate structures (large and small electrical users) and the number of hours the plug-ins are on per week.

For the small consumer, most of the cost is related to the consumption, or how long the plug-ins are left on. For the large consumer, most of the cost is associated with the demand, that is, how many plug-ins and other electrical devices are on at the same time.

Table 2 shows the type of plug-in control devices recommended for users serviced by the major electrical utilities in Alberta. The selection of a control device depends on the category of electrical user (large or small) and on the type of rate structure (demand- or energy-oriented) used to calculate the customer's bill.

Installing controllers is a cost-effective way to reduce annual vehicle plug-in costs by 50 to 80 per cent without losing the benefits of engine block heaters. Owners and operators can usually expect a payback of less than two years on their investment.

Annual Operating Costs Per Vehicle

TABLE 1

Types of Parking	Category of Electrical User	Annual Cost Range
Employee parking lot (45 hrs/week)	small large	\$20 - \$ 34 \$27 - \$ 98
Company overnight parking (128 hrs/week)	small large	\$50 - \$ 70 \$41 - \$101
Special purpose vehicle parking (168 hrs/week)	small large	\$59 - \$ 92 \$56 - \$104

Based on early 1987 utility rates

Recommended Control Devices

TABLE 2

Rate Structure	Typical User	Annual Cost	Control Selection
Highly Energy Oriented	small	mainly energy	thermostat or timer or both
Energy and Demand Oriented	intermediate	more energy than demand	thermostat and timer
	large	more demand	timer
Highly Demand Oriented	large	mainly demand	timer or load shedding controller

SECTOR REVIEW

Electrical Use in Active-Care Hospitals

Energy use varies widely, depending on the type of building and the activities in that building. The variety of energy use has become evident following Energy Bus audits of almost every type of facility in Alberta.

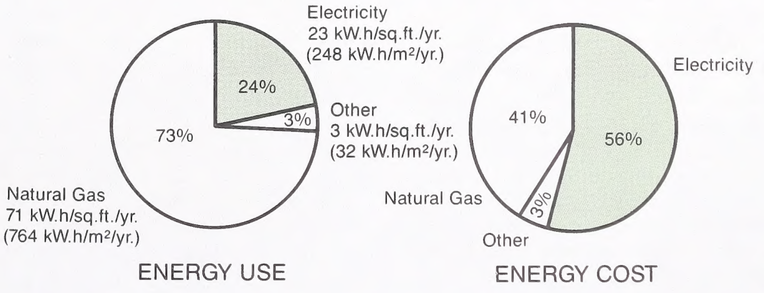
An energy audit determines how energy is being used and how much it costs in each area. Energy conservation measures are then identified which may result in energy cost savings. On average, the Energy Bus has identified a potential reduction in energy costs of about 20 per cent.

Figure 1 shows energy use in kilowatt hours per square foot per year (and per square metre) for electricity and natural gas and for other fuels used in the 33 active-care hospitals visited by Alberta's Energy Bus. Active-care hospitals provide acute care and/or extended care on a 24-hour basis.

Figure 1 also compares the use of energy and its associated costs in active-care hospitals. In Alberta,

FIGURE 1

ENERGY USE AND COST IN ACTIVE-CARE HOSPITALS



natural gas is the least expensive energy source. The average price of a unit of electrical energy is four to five times more than the equivalent unit of natural gas. Therefore, when analysing energy use, the associated energy costs must be considered.

Figure 2 shows how electrical energy is used in hospitals. Vehicle plug-ins represent four per cent of the electrical energy use. Energy Bus audits have identified considerable cost saving potential associated with plug-in use.

During winter, hospital parking lot plug-ins are used 24 hours a day due to shift work. As shown in Figure 3, if plug-in control devices are used by hospitals, cost savings of 50 per cent or more are possible.

During Alberta's cold winters, engine block heaters are necessary to ensure easy starting, longer engine life, safety and comfort. By installing plug-in control devices in parking lots, Albertans can obtain all these benefits without excessive cost.

FIGURE 2

ELECTRICAL ENERGY USE IN ACTIVE-CARE HOSPITALS

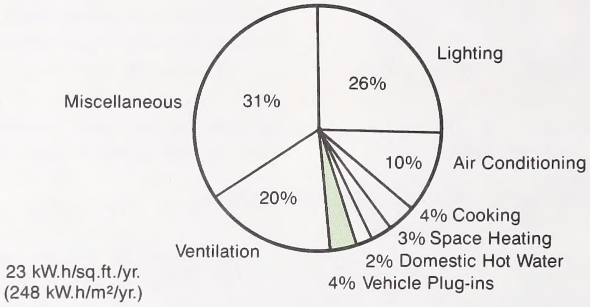
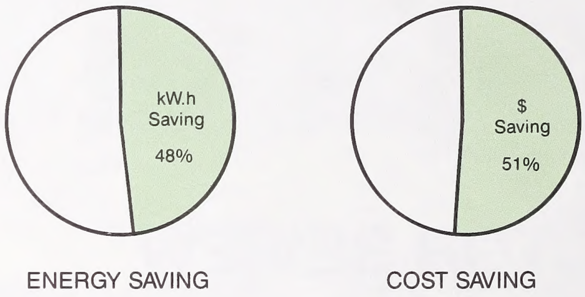


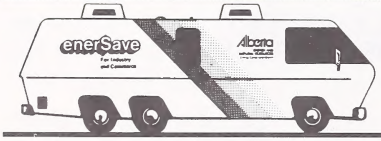
FIGURE 3

VEHICLE PLUG-IN SAVINGS POTENTIAL IN HOSPITALS



FOR MORE INFORMATION

The article Control Your Vehicle Plug-Ins and Save was researched by the late Nori Nishimura and the Sector Review was completed by Les Sladen. For more detailed information on energy cost saving calculations and the energy audit database, contact the industrial section of the Energy Conservation Branch: Phone 427-5200 (collect).



ENERGY $AVER$

Energy $aver$ is a series of fact sheets about energy conservation measures that have wide application in Alberta. Each issue highlights a different technology and its successful use in the province. The Sector Review summarizes energy use patterns of different facilities that have used Alberta's Energy Bus audit service. Comments, questions, and suggestions are welcome.

Write or phone (collect) to be placed on the mailing list. You may also receive back issues or arrange for an Energy Bus audit (conducted at no charge).

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